The disfiguring tape stain in the photo on page 41 will require approximately 10 hours of conservation treatment, including the application of heat, mechanical reduction of adhesive, solvent application to stabilize and reduce (but not completely remove) the tape stain, humidification, and flattening to minimize planar distortions in the sheet.

This brief description of the conservation treatment required for a damaged drawing from the collection illustrates why all aged tracing papers should be handled with care. Tracing paper is a fragile and tricky material, requiring delicate handling. All architectural drawings, regardless of support material, need special attention in order to retain their information and aesthetic composition.

Notes

1 Reed, Judith, Eléonore Kissel, and Erin Vigneau. "Photo-Reproductive Processes used in the Duplication of Architectural and Engineering Drawings: Creating Guidelines for Identification." *The Book and Paper Group Annual* 14 (1995): 41-49.

2 van der Reyden, Dianne, Christa Hofmann, and Mary Baker. "Some Effects of Solvents on Transparent Papers." The Institute of Paper Conservation: Conference Paper Sheila Fairbrass, 234-46 United Kingdom: G.W. Limited, 1992.

3 Keuffel and Esser Company. *Catalogue of Keuffel and Esser Company Manufacturers and Importers of Drawing Materials.* Hoboken, NJ: 1955.

References

Ehrenberg, Ralph. *Archives & Manuscripts: Maps and Architectural Drawings.* Chicago: Society of American Archivists, 1982.

Mass COPAR. Proceedings of the Symposium on the Appraisal of Architectural Records. Cambridge, 1987.

Nelb, Tawny Ryan. "Will Your Drawings Be There When You Need Them?" *Plan & Print* N64:12 (Dec.1991).

Price, Lois Olcott. "The History and Identification of Photo-Reproductive Processes used for Architectural Drawings Prior to 1930." *Topics in Photographic Conservation* 6 (1995): 41-49.

A comprehensive bibliography compiled in 1994 on conserving architectural drawings and oversize works of art on paper, by paper conservator Nancy Carlson Schrock, may be accessed via the internet at: http://palimpsest.stanford.edu/bib/

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Judith J. Bischoff

Conservation Science in the Parks

Not Just for Natural Resources

Ask the general public what they know about conservation in the National Park Service and they will likely reply—"You mean saving trees, water, animals and the environment in the parks?" If one were to ask what a conservation scientist working for the Park Service does, the answer would probably be that such a scientist studies the parks' natural resources. Most would be surprised to learn that one Park Service conservation scientist has little or nothing to do with natural resources, but instead studies cultural resources.

The cultural resources conservation scientist has several roles:

- To provide information to park curators and interpretive staff to aid them in interpretation of an artifact
- To provide information to conservators to aid them in their decisions regarding object storage, exhibition, and conservation treatment
- To carry out research projects related to the technology or provenance of museum artifacts, studies on mechanisms of deterioration of such artifacts, systematic development of new conservation materials, and evaluations of the long-term efficacy of previous conservation treatments

Tools of the Conservation Scientist

Several tools commonly used by the conservation scientist for examining or analyzing artifacts are infrared spectroscopy, optical microscopy, and ultraviolet-visible spectroscopy.

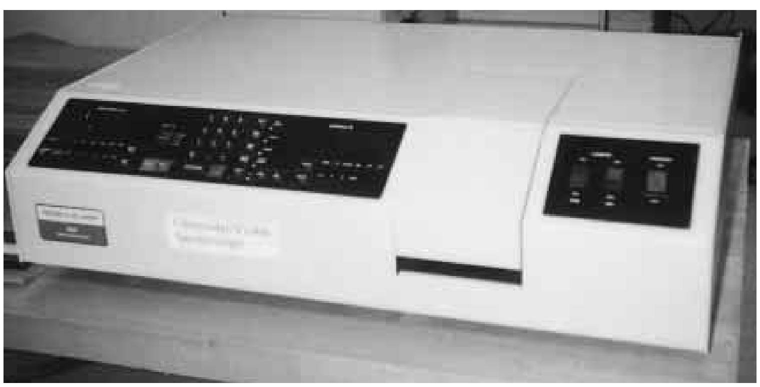
Fourier-transform infrared spectroscopy (FT-IR) is one of the most important tools of the conservation scientist. It can be used not only to identify organic materials including adhesives, coatings, and consolidants, but also for an array of inorganic materials such as paint pigments, metal corrosion, or salts from archeological objects. For example, FT-IR can help identify an adhesive used in a previous restoration, the varnish coating on historic furnishings or identify a fiber type or a paint binder.

The science lab at Harpers Ferry has successfully used infrared spectroscopy to confirm shellac as the original coating on a Baltimore, Maryland, wine cellarette from Hampton House National Historic Site, copper stearate as the waxy green corrosion product on a gun from the Fuller collection at Chicamauga-Chattanooga National Military Park in Georgia, and pyroxylin (cellulose nitrate) on some historic tracing papers being studied in conjunction with the conservation treatment of architectural drawings.

Optical microscopy is another important multi-purpose tool. For example, optical microscopy allows identification of fibers, paint pigments, corrosion products, or salt encrustations. It may also be used to examine objects or to observe chemical changes during microchemical testing on small samples from artifacts.

Ultraviolet-visible spectroscopy (UV/VIS) works on the same principle as infrared spectroscopy, but uses ultraviolet and visible light instead of infrared as the light source. One can use UV/VIS for analysis and identification of dyes found in textiles, lake pigments, leather or quills, or intentionally colored lacquers or glazes. This simple analysis involves extracting the dye into an appropriate solvent such as alcohol or water and measuring its spectrum. Although two dyes might appear to be the same color red, the spectrophotometer can detect differences that the eye cannot; that is, each dye has its own characteristic spectrum. Such information can be used to assign attribution to an object; for example, a particular weaver of a Native American tribe may use a particular group of dyes in weaving her rugs, or to determine that a coating on a brass lamp contains a yellow dye to brighten the appearance of the brass.

Fourier-Transform Infrared Spectrophotometer. Photo courtesy the author.



Ultraviolet/Visible Spectrophotometer. Photo courtesy the author.

There are, of course, many other tools important in the work of the conservation scientist, but they are beyond the scope of this article.

Current Project

Cumberland Island National Seashore, Georgia, is home to both natural and cultural resources. The endangered loggerhead sea turtle, numerous species of birds and plants, and the dunes come to mind when one thinks of some of the island's natural resources. The island is also home to a broad range of cultural resources. It was originally populated by Native Americans, and at some point, the Spanish had a mission on the island. Familiar are the 18th-century Miller-Greene tabby house and the 19th-century Carnegie mansions. At "The Settlement" on the north end of the island is the First African Baptist Church, known most recently for its famous wedding of John F. Kennedy, Jr.

The science lab at Harpers Ferry was recently asked to perform paint analysis on nine of the island's historic structures. This project began with a week-long sampling trip to Cumberland Island to work with Jennifer Bjork, Chief of Resource Management, and John Mitchell, curator. Several arduous but exhilarating days fending off sand flies and ticks, and imagining snakes at every turn produced nearly 60 paint samples for cross-section analysis.

Each small sample was imbedded in polyester resin, which when hardened, was polished to reveal the various paint layers. The color of the original paint layers were matched with a standard color system, the *Munsell Book of Color,* which gives the hue (color), value (lightness or

Plum Orchard Mansion. Photo courtesy NPS-HFC Photo Archives.

darkness) and chroma (color saturation). Matches were also made with commercial paint fan decks.

Some simple microchemical tests were used to help identify the paint pigment used. For example, the paint on the stucco of Plum Orchard Mansion was identified as a whitewash, while that on the window frames, columns, and balustrade was probably lead white.

Information about paint binders will also be obtained from the cross-sections. Special colored dyes or stains which preferentially bind with a particular paint binder and fluoresce in the presence of ultraviolet light will be applied to the cross-section. Application of the fluorescent dye, rhodamine B, will help identify oil paints, while the colored dye, Ponceau S, will help to identify casein (milk) paints or glue-based paints.

The results from the various analyses will aid the park in its restoration and preservation efforts. They will also provide more detailed information for interpretation of the park's historic structures to visitors enjoying the island's cultural offerings.

Future Project

Part of the role of the conservation staff is to advise exhibits staff on appropriate exhibit materials. This collaboration between conservation and exhibits ensures that objects are given the best possible care, while at the same time being exhibited to their best advantage. Thus, use of an exhibit case material that can harm objects is something that both conservators and exhibit specialists wish to avoid.

To support conservators and exhibits staff in this effort, the science lab at Harpers Ferry will be setting up a new testing method for identifying exhibit materials that might be hazardous to museum artifacts. This method involves a relatively simple setup requiring a specially equipped computer and an electrochemical cell. The method measures the level of harmful substances extracted from a material being considered for use in an exhibit case. It is hoped that this rapid and efficient method, that takes less than a day to perform, will replace the earlier Oddy test, which was not only extremely slow (greater than one month for results), but also inconsistent and subjective in its results. The science lab plans to develop a database of appropriate materials for construction of exhibits and to train other conservation labs wishing to adopt this method to create their own databases.

Of current concern to Native American groups is the presence of pesticide residues on artifacts being requested for repatriation. Because these objects may be worn during ceremonies, it is of extreme importance that any toxic pesticide residues be identified. Pesticides such as toxic arsenic and mercury compounds, chlorocarbons such as Chlordane, and para-dichlorobenzene (PDB) or fumigants such as sulfuryl fluoride (Vikane) and ethylene oxide, were commonly used to prevent insect infestation of organic objects. Although some information is known about what pesticides were used in collections of Native American objects, little is known about how toxic these materials still are, how to identify them and most importantly, how to remove such residues. We hope that our part in this major research effort will be to develop some "low tech" field methods for the identification of organic pesticide residues.

A Final Word

The few examples reported here are intended to give the reader a sense of the important scientific work being done to aid in the interpretation and preservation of the vast cultural resources of the national parks. While no one would argue the importance of preserving and interpreting the parks' natural resources, the fact that most Americans think of the parks in terms of their natural beauty, gives those of us who work on the cultural resources side the opportunity to raise the awareness of preserving these equally important park resources.

The issues facing scientists studying cultural resources are not all that different from those concerned with natural resources. In keeping with the Mission of the National Park Service, both groups are dedicated to protecting those resources and providing for "the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations."

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